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III. "A Tabular Form of Analysis, to aid in tracing the Possible Influence of Past and Present upon future states of Weather." By S. ELLIOTT HOSKINS, F.R.S., &c. Received March 28, 1867.

The data upon which the present communication is founded are derived from the 'Greenwich Reports,' from Mr. Glaisher's papers in the *Philosophical Transactions*, and from my own observations at Guernsey. The latter were commenced in the autumn of 1842, in accordance with the recommendations of the Committee of Physics of the Royal Society, and were taken at the request of Professor Daniell, by whom the instruments employed were selected. These instruments, made by Newman, were after a time replaced by others, at the suggestion of Mr. Glaisher, by whom they were compared with the standards at the Royal Observatory.

For my own guidance in the first instance, I sought to arrange the results thus obtained in such a manner as to discover, if possible, whether any month or class of months stood to each other in the relation of cause and effect; in other words, whether the atmospheric conditions of autumn exercised any distinguishable influence upon the fruitful or unfruitful character of ensuing seasons.

In order to attain this object, the principle seemed to be that of condensing within narrow limits, by means of intelligible symbols, as many elements of weather, in the popular acceptation of the word, as might be required. But the ordinary curvilinear form of diagram could not be so modified as to answer this purpose, and I therefore availed myself of a plan suggested by Mr. Galton:—that of converting the records of observations into appropriate signs, and placing them compactly in a series of squares.

Upon this principle the annexed diagrams* are constructed, comprising those elements of weather which more directly affect vegetation; viz. heat, cold, dryness, moisture, and their combinations. The same kind of preparatory steps were taken for the compilation of the Greenwich as for the Guernsey diagram, so as to render the results comparable—less, perhaps, for the sake of mere comparison, than for the purpose of testing the value of the latter by means of an accredited standard.

The first process consisted in copying out the degrees of monthly mean temperature, the number of rainy days, and the days of wind, from four directions, intermediate to the cardinal points. These several copies being verified, the monthly average of each of the above elements for twenty years, from 1843 to 1862, was taken.

The next step was to obtain the difference between the adopted average and the mean of each month in every year. By prefixing the plus and minus signs to the resulting figures, the excess and defect of each element is shown.

The third process was to separate the above-mentioned series of years

* [The diagrams are not published, but are preserved for reference in the Archives of the Society.]

TABLE I.—Monthly Mean Temperature in Excess and Defect of an average of Twenty Years, at Guernsey.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Average of 20 years	43·5	42·5	43·7	47·2	51·9	56·7	60·5	60·7	58·4	54·2	48·3	45·4	
First decade.	1843. + 0·8 44. + 2·3 45. - 0·4 46. + 3·1 47. - 1·4 48. - 2·8 49. + 2·2 50. - 4·0 51. + 3·2 52. + 1·9	- 2·0 + 0·6 - 2·6 + 4·5 - 1·4 + 3·3 + 4·4 + 3·6 + 1·1 + 1·1	+ 1·0 + 1·7 - 4·5 + 2·9 - 0·3 + 2·3 + 1·8 - 0·3 + 1·8 - 0·5	+ 1·1 + 4·6 - 0·3 + 1·7 - 0·6 + 2·0 - 1·1 + 0·7 + 0·1 - 0·9	- 0·2 + 1·0 - 0·3 + 2·9 - 0·6 + 5·8 + 2·2 - 0·6 - 0·4 - 0·3	- 1·7 + 2·2 + 2·4 + 6·5 + 2·7 + 0·1 + 2·2 + 1·9 + 1·9 - 1·3	+ 0·3 + 0·3 - 0·5 + 2·6 + 0·3 + 0·4 + 1·0 + 0·7 + 4·5 + 3·4	+ 0·9 - 0·7 + 1·3 + 2·4 + 3·0 - 1·2 + 2·1 - 0·1 + 2·1 + 0·2	+ 3·1 + 1·8 - 0·9 + 3·8 + 1·0 + 0·9 + 0·5 - 0·1 + 0·4 - 0·8	- 0·2 + 0·2 - 0·1 + 0·7 - 0·2 + 0·1 + 0·2 - 3·7 + 0·1 - 3·0	+ 1·3 + 1·0 + 2·5 + 1·3 + 3·1 - 0·4 + 1·3 + 1·5 - 3·8 + 3·7	+ 2·9 - 4·6 + 1·4 - 3·7 + 1·8 + 2·8 - 0·9 + 0·8 - 0·5 + 4·6	
Months { Warm Cold Degrees {	6 4 + 13·5 - 8·6	6 4 + 18·0 - 6·6	6 4 + 11·5 - 5·6	6 4 + 10·2 - 2·9	5 5 + 14·0 - 1·8	8 2 + 17·5 - 3·0	9 1 + 16·2 - 0·5	6 4 + 8·7 - 3·3	6 4 + 10·5 - 2·0	6 4 + 3·2 - 7·0	8 2 + 15·7 - 4·2	6 4 + 14·3 - 9·7	78 42 + 153·3 - 55·2
Second decade.	1853. + 2·5 54. - 0·6 55. - 3·4 56. + 0·5 57. - 0·8 58. - 0·8 59. + 1·6 60. + 1·3 61. - 4·7 62. - 0·2	- 5·4 - 0·1 - 6·0 + 1·5 - 0·8 - 1·5 + 3·1 - 3·5 + 1·2 + 0·9	- 4·9 + 0·9 - 2·3 - 1·5 - 0·5 - 0·7 + 2·6 - 1·4 + 1·6 + 1·2	- 0·7 + 0·8 - 2·8 - 0·5 - 1·3 + 1·2 + 1·0 - 4·6 - 1·0 + 0·4	- 1·4 - 1·2 - 3·1 - 2·6 - 0·2 - 1·9 + 1·8 - 4·1 - 1·0 + 0·4	- 2·2 - 4·0 - 2·9 - 1·4 + 1·2 + 1·7 + 0·2 - 4·3 - 2·8 - 2·5	- 2·5 - 1·9 - 1·3 - 1·6 + 1·2 - 2·8 + 4·6 - 4·3 - 2·8 - 3·4	- 2·1 - 0·3 - 0·2 + 0·9 + 1·9 - 0·6 + 2·2 - 4·7 - 0·4 - 2·1	- 2·5 + 0·1 - 0·9 - 2·1 + 2·1 + 1·7 - 0·4 - 4·1 - 0·8 - 0·8	- 0·8 - 0·7 - 0·5 + 0·7 + 1·6 + 0·4 + 0·3 - 1·1 + 3·3 + 0·5	- 0·2 - 1·8 - 2·2 - 0·8 + 2·6 - 2·6 + 0·2 - 2·3 - 1·7 - 2·4	- 4·3 + 1·0 - 2·5 + 1·2 + 3·2 + 0·8 - 2·1 - 3·1 - 0·1 + 2·0	
Months { Warm Cold Degrees {	4 6 + 5·9 - 10·5	4 6 + 6·7 - 17·3	4 6 + 6·3 - 11·3	4 6 + 3·4 - 10·9	2 8 + 2·2 - 12·7	3 7 + 3·1 - 18·5	2 8 - 5·8 - 20·6	3 7 + 5·0 - 10·4	3 4 + 3·9 - 11·6	6 2 + 6·8 - 3·1	8 5 + 2·8 - 14·0	5 5 + 9·2 - 12·1	42 78 + 60·1 - 153·0
	1863. + 1·4 64. - 1·8 65. - 1·7 66. + 2·7 67. - 3·5	+ 2·4 - 3·2 - 1·7 + 2·1 -	+ 1·4 + 1·1 - 4·7 + 1·4 -	+ 0·6 + 1·1 + 2·7 + 0·5 -	- 1·7 + 1·4 + 0·7 - 2·0 -	- 2·6 - 2·4 + 0·8 + 0·4 -	- 1·3 - 1·4 + 0·5 - 2·1 -	- 0·4 - 2·0 - 1·3 - 2·2 -	- 3·8 - 0·7 + 4·4 - 2·6 -	- 1·0 - 0·9 + 2·2 + 0·7 -	+ 0·3 - 0·9 + 1·2 + 1·3 -	- 2·2 - 2·5 + 0·4 + 2·6 -	

TABLE

Average of 20 years	1843. + 0·8 44. + 2·3 45. - 0·4 46. + 3·1 47. - 1·4 48. - 2·8 49. + 2·2 50. - 4·0 51. + 3·2 52. + 1·9
First decade.	- 2·0 + 0·6 - 2·6 + 4·5 - 1·4 + 3·3 + 4·4 + 3·6 + 1·1 + 1·1
Months { Dry Wet	6 4 + 13·5 - 8·6
Second decade.	- 5·4 - 0·1 - 6·0 + 1·5 - 0·8 - 1·5 + 3·1 - 3·5 + 1·2 + 0·9
Months { Dry Wet	4 6 + 6·7 - 17·3
	+ 1·4 - 3·2 - 1·7 + 2·1 -

TABLE III.—Direction of Wind. Number of Days in Excess and Defec

	January.				February.				March.				April.				May.				June.				Jul.	
	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.
	6	9	9	7	8	8	8	4	10	9	7	5	10	9	7	4	12	8	7	4	8	9	10	3	8	10
1843.	-4	+7	+1	-4	+5	-3	-4	+2	+2	-5	-0	+3	-6	+3	+3	-0	-5	+1	+1	+3	+5	-0	-2	-3	-6	+4
44.	+4	+5	-3	-6	-4	+5	+2	-2	-1	-1	+4	-2	+5	+1	-2	-4	+13	-3	-6	-4	-1	-1	+1	+1	-0	+4
45.	-5	-0	+2	+3	+3	-3	-6	-0	+6	-0	-2	-4	+3	-2	-1	-0	-1	+4	-0	-3	+2	-0	-0	-2	-0	-5
46.	-4	+3	+2	-1	-3	+3	-1	+1	-7	+4	+5	-2	-1	+2	-0	-1	-0	+1	+3	-4	+12	-4	-5	-3	-3	-1
47.	+4	-4	-3	+3	+2	+1	-1	-2	+3	-3	-2	+2	-8	+7	+3	-2	-7	-0	+4	+3	+3	-2	-0	-1	+5	+2
48.	+7	-0	-5	-2	-6	+3	+7	-3	-7	+8	+1	-2	-0	-1	+2	-1	+10	-3	-5	-2	-3	-2	+7	-2	+2	+2
49.	-2	+4	+3	-5	-5	+4	-3	-2	+2	+1	-4	+1	-3	+3	-1	+1	-3	+3	+1	-1	-3	+7	+6	-10	-3	-1
50.	+6	-2	-2	-2	-5	+2	+5	-2	+5	-1	-3	-1	-3	-4	+5	+2	-1	+2	-2	+1	+3	-0	-2	-1	-1	+2
51.	-6	-3	+5	+4	+4	-3	-4	+3	-9	+3	+7	-1	+3	+1	+2	-4	-2	+3	-1	-0	+1	-1	+3	-3	-3	+3
52.	-6	-4	+6	+4	-2	+7	-2	-2	+12	-8	-5	+1	+14	-9	-5	-0	+4	-3	-2	+1	-8	-7	+13	+2	+6	-2
1853.	-2	+1	+2	-1	+5	-0	-6	+1	+3	-4	-0	+1	-8	+9	-2	+1	+2	+2	-2	-2	-2	+1	+2	-1	-7	-6
54.	-4	+2	-4	+6	-2	+6	-2	-2	+2	-2	-0	-0	+10	-2	-6	-2	-5	-3	+7	+1	-0	-2	+1	+1	+3	-2
55.	+9	+1	-5	-5	+8	-5	-3	-0	+3	-4	-4	-3	+4	+2	-2	-4	-1	-0	-0	+1	-1	+2	-1	-1	-3	-1
56.	+3	-2	-2	+1	+4	-6	+2	+1	+14	-5	-7	-2	-0	-3	-2	+5	-7	-0	+4	+3	+1	+4	-3	-2	-2	+4
57.	+2	+7	-3	-6	-0	-5	-1	+6	-1	-4	+3	+2	-5	+1	+2	+2	+5	-2	-4	+1	+2	-4	-3	+4	-3	-1
58.	+1	-2	-1	+2	-3	-6	-3	+6	+1	+3	-6	+2	-1	-3	-1	+5	-2	+6	-2	-0	+5	-5	-0	-4	+7	-2
59.	+1	-1	-0	-0	-6	+2	+3	+1	-9	+5	+6	-2	-5	-1	+6	-0	+8	-1	-5	-2	+2	+2	-6	+2	+5	+2
60.	-4	-1	+2	+3	+1	+5	-4	-1	-8	+6	+3	-1	+5	-1	-2	-2	-4	-3	+8	-1	-7	+2	+6	-1	+2	+6
61.	+3	-8	+2	+3	-5	-4	+5	+4	-8	+5	+4	-1	+8	-2	-6	-0	-3	+9	-4	-2	-0	+2	-2	-0	-6	-3
62.	-2	-2	+2	+2	+2	-6	+2	+2	-0	-5	+2	+3	-2	-2	+3	+1	-4	+2	+3	-1	-6	+7	-0	-1	-7	-0
1863.	-1	-1	+3	-1	-4	-1	+2	+3	-8	+6	+3	-1	-6	+9	-1	-2	+1	+3	-2	-2	-5	+1	+3	+1	+5	-1
64.	+3	-7	+1	+3	+3	-3	+1	-0	-2	-2	+3	+1	+4	-0	-4	-0	+2	+4	-3	-3	-6	+4	+4	-2	+3	-3
65.	-2	+2	+1	-1	-2	-3	+6	-1	-2	+5	-3	-0	+7	-7	-4	+4	-5	-4	+4	+5	+6	+2	-7	-1	+7	+4
66.	-5	-1	+7	-1	-5	-1	+5	+1	+1	-1	-1	-1	-1	-5	+5	+1	+1	-1	+1	-1	+6	-2	-1	+3	+2	-1
67.	+1	-2	+3	-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Days in Excess and Defect of an average of Twenty Years, at Guernsey.

June.			July.				August.				September.				October.				November.				December.				
N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	N.E.	N.W.	S.W.	S.E.	
9	10	3	8	10	11	2	6	13	10	2	12	8	7	3	6	9	11	5	7	10	7	6	7	8	10	6	
5	-0	-2	-6	+4	+1	+1	+2	-3	-3	+4	+3	+1	-5	+1	-4	+5	+2	-3	-0	-1	+4	-3	-0	-1	-5	+2	+3
1	-1	+1	-0	+4	-3	-1	-1	+1	+2	-2	+6	-4	-1	-1	-1	+2	+2	-3	-0	-6	+6	-0	+12	-6	-8	+2	+3
2	-0	-0	-0	-5	+5	-0	-0	-2	-1	-1	+1	+1	-0	-2	-4	+5	-1	-0	-0	-4	+2	+2	-6	+6	+6	-6	-6
12	-4	-5	-3	-1	+2	+2	+4	-2	-1	-1	+3	-0	-3	-0	-0	+0	+2	-1	+3	-4	+2	-1	+6	+5	-5	-6	-6
3	-2	-0	+5	+2	-6	-1	+4	+4	-6	-2	-9	+9	+1	-1	+3	-4	-0	+1	-5	+4	-3	+4	-3	+3	-3	+3	+3
3	-2	+7	+2	-2	+1	-1	-5	-1	+7	-1	+4	-2	-4	+2	+2	+2	+4	-4	-3	+8	-1	-4	+0	-3	+4	-1	-2
7	+6	-10	+1	-0	-1	-0	-3	+8	-5	-0	+4	-4	-2	+2	+4	-4	+2	-2	-3	-1	+1	-4	+3	+1	-2	-2	-1
3	-0	-2	-1	+2	-0	-1	-4	+3	+3	-2	+5	-3	-1	-1	+1	+4	-2	-3	-2	-1	+6	-4	-1	-1	-1	-1	+3
1	-1	+3	-3	+3	-0	-0	+3	-2	-0	-1	+7	-2	-3	-2	+4	-1	-0	-3	-2	+0	-3	-5	+11	-2	-3	-6	-6
8	-7	+13	+2	-2	-	+2	-1	-5	+7	-1	-5	+6	-3	+2	+6	-0	-3	-3	-4	-3	+4	+3	-7	-3	+8	+2	+2
2	+1	+2	-7	-2	+12	+1	+6	-3	-3	-0	-5	+3	+3	-1	-2	-2	-1	+5	+6	-4	+2	+10	-1	-9	-0	-0	
0	-2	+1	+3	-2	+1	-2	+5	+1	-6	-0	+4	-4	-1	+1	-0	+5	-4	-1	-0	+4	-2	-2	-7	+17	-4	-6	
1	+2	-1	-13	+1	+0	-2	+4	-9	+4	+1	+6	-2	-3	-1	-6	+4	+2	-0	+6	-2	-4	-0	+1	+4	-6	+1	
1	+4	-3	-2	+4	-2	-0	+3	-4	-1	+2	-5	+3	+2	-0	+7	-6	-5	+4	-1	+8	-4	-3	+4	+4	-1	+1	
2	-4	-3	+4	-3	+1	+2	+6	-6	-1	+1	-6	-5	+8	+3	-3	-3	-1	+7	+4	-7	-2	+5	-4	-5	+4	+5	
0	-2	-5	-0	-4	-7	-2	-1	+8	-6	-1	-3	+4	+4	+3	+5	-4	-1	-0	+10	-8	-5	+3	-2	-3	+3	-2	
2	+2	-6	+2	+5	-2	-6	+2	+1	-6	+3	-8	+4	+4	-0	+1	-0	-3	+2	-1	-4	+1	+4	-1	-4	+5	-2	
7	+2	+6	-1	+2	-6	-2	-6	-2	+8	-0	-4	+1	+2	-1	-3	+1	-0	+2	+6	-6	-3	+3	-2	+1	-3	+4	
0	-2	-0	-1	-3	+6	+3	-4	-3	+4	+3	-10	+1	+6	+3	+6	-6	-5	+5	-4	-0	+7	-3	+4	+1	-4	+1	
6	+7	-0	-1	-7	-0	+5	+1	-1	-1	+1	-0	-1	+1	-0	-2	-0	+1	+1	+4	-1	-3	-0	-6	+4	+3	-1	
5	+1	+3	+5	-1	-5	+1	-4	-5	+8	+1	-11	+5	+6	-0	-2	-4	+3	+3	-4	-5	+6	+3	-5	+6	+2	-3	
6	+4	+4	+3	-3	-0	-0	+5	-1	-3	-1	-8	-0	+9	-1	+0	-6	-4	-0	+2	-0	+6	-0	+5	-4	-4	+3	
0	-2	-1	-7	+4	-1	+3	-2	-4	+4	-2	-0	-2	-2	+4	-0	-0	-0	-0	-0	-2	-0	+2	-5	-1	-1	+1	
-	-	+3	+2	-1	-1	-0	-3	+1	-0	+2	-10	-2	+10	+2	+8	-4	-6	+2	-4	+1	+7	-4	-	-	+4	+4	

TABLE IV.—Analytical (Guernsey).

First decade.—1843 to 1852.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Warm.		Cold.			Warm. A+B	Cold. C+D					
														Dry.	Wet.	Dry.	Wet.								
														A	B	C	D								
	{ 1843. 44. 45. 46. 47. 48. 49. 50. 51. 52.	B	D	A	B	D	D	A	A	A	D	B	A	5	3	0	4		8	4	{ 1853. 54. 55. 56. 57. 58. 59. 60. 61. 62.				
		A	D	B	A	A	A	A	D	A	B	A	C	7	2	1	2		9	3					
		C	C	D	C	C	A	D	C	D	C	A	B	2	1	6	3		3	9					
		B	A	D	B	B	A	B	B	A	C	B	C	4	7	1	0		11	1					
		C	D	C	B	D	B	A	A	D	A	A	B	5	2	2	3		7	5					
		C	B	B	B	A	B	B	D	A	B	D	A	3	6	1	2		9	3					
		B	A	A	D	B	A	B	A	B	B	D	A	5	5	0	2		10	2					
		C	B	C	B	D	A	B	D	C	C	B	A	2	4	4	2		6	6					
		B	A	B	B	C	A	A	A	A	C	D	C	6	3	2	1		9	3					
		B	A	C	C	D	D	A	A	D	C	B	B	3	3	3	3		6	6					
		Warm	{ Dry A Wet B	1	4	2	1	2	7	5	5	5	2	5	3	42						{	78		{
				5	2	4	5	3	1	4	1	1	4	3	3	36									
{ Dry C Wet D	4		1	3	2	2	0	0	1	1	3	0	3	20				{	42						
	0		3	1	2	3	2	1	3	3	1	2	1	22											

Warm and Cold Months.

		January.		February.		March.		April.		May.		June.		July.	
		Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.
First decade.	A+B and C+D	6	4	6	4	6	4	6	4	5	5	8	2	9	1
Second „	a+b and c+d	4	6	4	6	4	6	4	6	2	8	3	7	2	8

Dry and Wet Months.

		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
First decade.	A+C and B+D	5	5	5	5	5	5	3	7	4	6	7	3	5	5
Second „	a+c and b+d	5	5	8	2	4	6	7	3	5	5	5	5	5	5

TABLE IV.—Analytical (Guernsey).

Second decade.—1853 to 1862.

l. Vet.	D	Warm. A+B	Cold. C+D		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Warm.		Cold.		Warm. a+b	Cold. c+d			
																	Dry. Wet.		Dry. Wet.						
																	a	b	c	d					
4		8	4	{	1853.	b	d	d	c	c	d	d	c	d	c	c	o	1	5	6	1	11			
3		9	3		54.	d	c	a	a	d	c	d	a	c	d	c	c	1	4	4	4	8			
3		3	9		55.	c	c	d	c	d	c	d	c	c	d	c	c	o	8	4	o	12			
0		11	1		56.	b	a	c	d	c	c	b	b	a	c	c	2	3	4	3	5	7			
3		7	5		57.	d	c	c	d	c	a	a	d	b	a	b	5	2	3	5	7	5			
2		9	3		58.	c	c	c	a	c	a	c	c	b	a	c	b	3	2	7	o	5	7		
2		10	2		59.	a	a	b	b	b	b	a	a	d	b	a	a	5	4	o	3	9	3		
2		6	6		60.	b	c	b	c	d	d	c	d	c	c	c	d	o	2	5	5	10	7		
1		9	3		61.	c	b	b	c	c	d	d	c	d	a	d	o	1	2	5	4	3	9		
3		6	6		62.	c	a	b	a	b	c	d	c	d	b	c	b	2	4	4	2	6	6		
{	{	78	42	{	Warm	{	Dry A	1	3	1	3	o	2	2	1	3	2	1	21		{	42			
							Wet B	3	1	3	1	2	1	o	1	2	3	o	4	21					
						{	Dry C	4	5	3	4	5	3	3	6	1	2	6	3	45			{	78	
							Wet D	2	1	3	2	3	4	5	1	6	2	2	2	33					

Warm and Cold Months.

May.		June.		July.		August.		September.		October.		November.		December.		Total.	
Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.
5	5	8	2	9	1	6	4	6	4	6	4	8	2	6	4	78	42
2	8	3	7	2	8	3	7	3	7	6	4	2	8	5	5	42	78

Dry and Wet Months.

Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
4	6	7	3	5	5	6	4	6	4	5	5	5	5	6	4	62	58
5	5	5	5	5	5	8	2	2	8	5	5	8	2	4	6	66	54

TABLE V.—Monthly Mean Temperature in Excess and Defect of an average of Twenty Years, at Greenwich.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Average of 20 years.....	38·6	38·7	41·6	46·4	52·7	54·0	61·9	61·3	57·0	50·8	43·0		
First decade.	1843. + 1·3 44. + 0·5 45. - 0·3 46. + 5·1 47. - 3·5 48. - 4·0 49. + 1·5 50. - 4·9 51. + 4·3 52. + 3·4	- 2·7 - 3·5 - 6·0 + 5·2 - 2·3 + 4·7 + 4·5 + 6·0 + 1·4 + 2·1	+ 1·3 - 0·1 - 6·4 + 1·7 - 0·6 + 2·2 + 0·9 - 1·7 + 1·0 - 0·3	+ 0·7 + 5·3 - 0·1 + 0·7 - 1·1 + 1·2 - 3·2 + 2·1 - 1·7 - 0·5	- 0·5 + 0·2 - 3·3 + 1·9 + 3·7 + 7·0 + 1·3 - 1·4 - 1·8 - 1·2	- 2·7 + 1·7 + 1·7 + 6·3 - 1·0 - 0·5 - 1·1 + 1·8 - 0·1 - 2·9	- 1·0 - 0·5 - 2·1 + 2·6 + 3·5 - 0·4 + 0·2 + 0·3 + 1·8 + 4·7	+ 0·8 - 3·6 - 4·0 + 1·9 + 0·8 - 2·8 + 1·6 - 1·1 + 1·0 + 0·8	+ 2·5 - 0·1 - 3·4 + 3·1 - 2·7 + 1·8 + 0·6 - 0·1 - 0·2	- 2·8 + 1·3 - 0·6 - 0·3 + 2·1 + 0·3 - 3·8 + 1·8 - 2·9	+ 0·8 + 1·0 + 2·8 + 3·0 + 3·9 + 0·8 + 1·1 + 3·5 - 5·1 + 5·9	+ 3·9 - 7·0 + 1·7 - 7·1 + 2·8 + 4·4 - 0·9 + 0·6 + 0·4 + 7·6	
Months { Warm Cold Plus Minus	6· 4· + 16·1 - 12·7	6· 4· + 23·9 - 14·5	5· 5· + 7·1 - 9·1	5· 5· + 10·0 - 6·6	5· 5· + 14·1 - 8·2	4· 6· + 11·5 - 8·3	5· 5· + 11·3 - 5·8	6· 4· + 6·9 - 11·5	3· 7· + 7·4 - 8·3	4· 6· + 5·0 - 11·7	9· 1· + 22·8 - 5·1	7· 3· + 21·4 - 15·0	157·5 116·8
Second decade.	1853. + 3·8 54. + 0·4 55. - 3·7 56. + 0·8 57. - 2·0 58. - 1·1 59. + 1·8 60. + 1·1 61. - 4·8 62. + 0·4	- 5·4 + 0·8 - 9·3 + 3·3 + 0·5 - 4·1 + 4·4 - 3·0 + 3·4 + 2·4	- 3·1 + 2·2 - 3·7 + 2·9 - 0·2 - 0·2 + 4·8 - 0·5 + 2·5 + 3·5	- 1·2 + 2·0 - 0·6 + 0·4 - 0·7 - 0·2 + 0·2 + 3·5 - 2·1 + 2·0	- 0·7 - 1·8 - 3·9 - 3·2 + 1·3 - 1·0 + 0·4 + 1·1 - 0·8 + 2·7	- 0·8 - 3·3 - 2·1 - 0·5 + 2·8 + 5·9 + 2·4 - 4·2 + 0·1 - 2·7	- 1·6 - 1·6 + 0·2 - 0·8 + 2·6 - 1·2 + 6·2 - 4·3 + 1·0 - 2·8	- 1·3 - 0·4 + 0·8 + 2·3 + 4·5 + 0·7 + 2·2 - 3·6 + 1·9 - 1·8	- 1·7 + 1·1 + 0·1 - 1·8 + 2·7 + 3·3 - 0·3 - 3·6 + 0·1 + 0·7	+ 0·1 + 1·4 + 0·4 + 0·9 + 2·1 - 0·1 + 0·1 - 0·2 + 4·1 + 1·0	- 0·9 - 2·5 - 1·7 - 2·3 + 2·8 - 3·4 - 1·1 - 2·2 - 2·2 - 3·2	- 6·0 + 1·3 - 4·4 + 0·2 + 5·1 + 1·0 - 3·2 - 3·7 + 1·0 - 6·4	
Months { Warm Cold Plus Minus	6· 4· + 8·3 - 11·6	6· 4· + 14·8 - 21·8	5· 5· + 13·2 - 10·4	4· 6· + 4·6 - 8·3	4· 6· + 5·5 - 11·4	4· 6· + 11·2 - 13·6	3· 7· + 9·0 - 13·3	6· 4· + 12·4 - 7·1	6· 4· + 8·0 - 7·4	8· 2· + 10·1 - 0·3	1· 9· + 2·8 - 19·5	5· 5· + 8·6 - 23·7	108·5 148·4
	1863. + 3·2 64. - 2·1 65. - 2·3 66. + 4·0 67. -	+ 3·4 - 2·7 - 2·1 + 1·8 -	+ 2·3 - 0·3 - 5·0 - 1·1	+ 2·7 + 1·8 + 5·9 + 1·5	- 0·7 + 1·1 + 3·4 - 2·6	- 0·9 - 1·6 + 1·2 + 1·9	- 1·1 - 0·1 + 1·9 - 0·9	+ 0·6 - 1·7 - 1·4 - 1·9	- 3·3 - 0·1 + 6·9 - 0·6	+ 0·8 - 0·3 + 0·1 + 0·5	+ 2·7 - 1·8 + 1·2 + 1·3	+ 3·2 - 1·5 + 2·4 + 2·9	

TABLE VI.—N

	Ja
Average of 20 years	I
First decade.	1843. - 44. + 45. - 46. - 47. + 48. - 49. + 50. - 51. - 52. +
Months { Dry Wet	
Second decade.	1853. + 54. - 55. + 56. + 57. + 58. - 59. - 60. + 61. - 62. +
Months { Dry Wet	
	1863. + 64. - 65. + 66. + 67. -

TABLE VII.—Analytical (Greenwich

First decade.—1843 to 1852.

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Warm.		Cold.		Warm. A + B	Cold. C + D				
														Dry. Wet.		Dry. Wet.							
														A	B	C	D						
	{ 1843. 44. 45. 46. 47. 48. 49. 50. 51. 52.	A	D	A	B	D	D	D	A	A	D	B	A	5	2	0	5	7	5	{ 1853. 54. 55. 56. 57. 58. 59. 60. 61. 62.			
		B	D	D	A	D	A	B	D	C	D	B	B	3	2	2	5	5	7				
		C	C	C	D	D	B	D	D	C	C	B	B	0	3	3	6	3	9				
		A	A	B	B	A	A	B	D	D	D	A	C	6	4	1	1	10	2				
		D	D	D	B	B	A	D	B	D	B	B	A	2	4	0	6	6	6				
		C	B	B	B	A	D	D	B	D	B	B	B	1	6	1	4	7	5				
		B	B	B	A	D	C	A	A	B	C	A	D	4	5	1	2	9	3				
		C	B	C	B	D	C	B	D	C	C	A	B	2	4	4	2	6	6				
		A	B	B	C	C	C	D	A	D	A	C	A	4	2	4	2	6	6				
		B	A	C	C	C	D	A	B	C	C	B	B	2	4	5	1	6	6				
Warm	{ Dry A Wet B	3	2	2	1	3	3	3	3	2	1	3	3	29				65		{ 55			
		3	4	3	4	2	1	2	3	1	3	6	4	36									
	{ Dry C Wet D	2	1	3	2	2	2	0	0	3	3	1	2			21							
		2	3	2	3	3	4	5	4	4	3	0	1					34					

Warm and Cold Months.

		January.		February.		March.		April.		May.		June.		July.	
		Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.
First decade.	A+B and C+D	6	4	6	4	5	5	5	5	5	5	4	6	5	4
Second „	a+b and c+d	6	4	6	4	5	5	4	6	4	6	4	6	3	7

Dry and Wet Months.

		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
First decade.	A+C and B+D	5	5	3	7	5	5	3	7	5	5	5	5	3	7
Second „	a+c and b+d	4	6	3	7	7	3	8	2	6	4	7	3	7	7

TABLE VII.—Analytical (Greenwich).

Second decade.—1853 to 1862.

		Warm. A+B	Cold. C+D													Warm.		Cold.						
				January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Dry.	Wet.	Dry.	Wet.	Warm. a+b	Cold. c+d			
																a	b	c	d					
{	65	5	5	{	1853.	b	d	c	d	c	c	d	c	a	b	c	c	2	7	3	2	{	2	10
		7	5		a	a	a	d	c	a	c	c	b	c	6	1	3	2	7	5				
		3	9		d	c	c	c	c	a	a	d	d	c	3	1	6	2	4	8				
		10	2		55.	b	a	c	d	c	a	d	a	a	5	1	4	2	6	6				
		6	6		56.	d	a	a	d	a	a	a	a	a	10	0	0	2	10	2				
		7	5		57.	c	c	c	a	d	a	a	c	c	4	0	7	1	4	8				
		9	3		58.	a	a	a	a	a	a	a	a	d	b	c	d	1	2	9	3			
		6	6		59.	b	d	d	c	a	d	c	d	d	c	c	d	1	4	2	10			
		6	6		60.	c	a	b	c	c	b	d	a	b	a	d	a	4	3	3	2		7	5
		6	6		61.	b	a	b	a	b	d	c	c	a	a	c	d	4	3	3	2		7	5
			62.	b	a	b	a	b	d	c	a	a	c	d	4	3	3	2	7	5				
{	55	Warm	{	Dry	a	2	6	3	4	3	3	3	6	5	5	1	4	45				{	58	
			{	Wet	b	4	0	2	0	1	1	0	0	1	3	0	1							13
		Cold	{	Dry	c	2	2	4	4	3	4	4	3	1	2	7	2		38			{	62	
			{	Wet	d	2	2	1	2	3	2	3	1	3	0	2	3							24

Warm and Cold Months.

May.		June.		July.		August.		September.		October.		November.		December.		Total.	
Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.	Warm.	Cold.
5	5	4	6	5	5	6	4	3	7	4	6	9	1	7	3	65	55
4	6	4	6	3	7	6	4	6	4	8	2	1	9	5	5	58	62

Dry and Wet Months.

Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
5	5	5	5	3	7	3	7	5	5	4	6	4	6	5	5	50	70
6	4	7	3	7	3	9	1	6	4	7	3	8	2	6	4	83	37

into two decennial periods or decades, and then to compute, not only the number of months above and below the average, but also the degrees of temperature. (See Tables I., II., III., V. and VI. in the Appendix.)

Lastly, the numerals thence derived were converted into simple and familiar signs, which were then delineated upon a sheet of sectional paper, accurately engraved according to scale. A square space was allotted to each of the months, and they were laid down as abscissas, with the years for ordinates. (See Diagrams I. and II. (Archives).)

The light squares in the diagrams denote warmth, the degrees being expressed by a modification of the plus sign, in red ink; the dark, or shaded squares indicate cold, and the degrees are marked in black ink with the minus sign. Black dots indicate the number of rainy days above the average, and red dots the number below it. The diagonal lines from the centre of each square show the direction and days of predominant wind, one-sixteenth of an inch being equivalent to five days beyond the mean; the red lines are associated with dryness, and the black with moisture. It may be necessary to explain that, as regards rainfall, frequency, rather than quantity, was selected as a criterion. That is to say, the number of days on which rain fell rather than the number of inches collected by the pluviometer; for it not unfrequently happens that a few heavy showers yield a greater amount of water than many days of gentle rain of long continuance.

The combined signs in the above arrangement are intended to represent four different states of weather, viz. warm + dry; warm + wet; cold + dry; and cold + wet.

If the sectional paper be large enough to admit of blank spaces being left, the signs of the weather may be delineated therein as each month elapses; and thus the diagram becomes a sort of register, and an ever-ready table of reference.

For instance, by running the eye along the vertical columns of the Guernsey diagram, to which I must confine myself for the present, the existing state of the weather can easily be compared with that of corresponding months, up to 1843; and by following each horizontal line of squares the character of each year may as readily be ascertained. Thus we shall find, on comparing the September of 1865 with that of preceding years, that it was the hottest and the driest of the whole series. On looking along the ordinate corresponding to 1846, it will be seen that during eleven months of that year the temperature was uniformly above the adopted average.

On taking a general view of this diagram, after its completion, a very cursory glance sufficed to show me that a striking difference existed in the distribution of light and shade. On closer inspection, it became manifest that the number of light squares in the one decade exactly counter-balanced the dark squares in the other; so that the warm months of the first period were in direct ratio to the cold months of the second.

These contrasts, quite unlooked for by me, were all the more surprising, as the data employed had been taken as they came, and not selected for the purpose of supporting any preconceived notion. It seemed to me, therefore, that this kind of diagram, besides serving as a convenient table of reference, was a collection of materials prepared and classified for further analysis. Under this impression I proceeded to decompose it, and to rearrange the products in a tabular form*—converting into letters of the alphabet the combined signs in the squares, so as to designate the four states of weather, before mentioned, as follows:—A=warm + dry; B=warm + wet; C=cold + dry, and D=cold + wet.

These letters were then placed in columns under the heads of months and years; the number of times in which each letter recurred was noted, and these numerals, which may be termed coefficients of the sums of the letters, were collected in lines and columns, those of the months at the foot, and those of the years at the sides of a table of analysis. See Table IV.

When the coefficients of the whole series were thus placed in juxtaposition, it was satisfactory to find that the general contrasts, noticed in the diagram, were borne out numerically; and still more satisfactory to ascertain that there was a close agreement between the ratio of the months and that of the degrees of temperature, plus and minus.

	Months.	Degrees.	
First decade.	78 warm to 42 cold.	153°·5 plus to 55°·2 minus.	} Guernsey.
Second decade.	78 cold to 42 warm.	153°·0 minus to 60°·0 plus.	

The columns at the sides of the Tables of analysis, that of Greenwich as well as Guernsey, indicate that there was the intrusion of one cold year (1845) in the warm period, and of two warm years (1857 and 1859) in the cold period. A similar kind of intercalation was pointed out by Mr. Howard, in his 'Cycle of the Seasons,' from 1824 to 1841, namely, the intrusion of one cold year in the warm, and one warm year in the cold cycle.

On examining the coefficients more in detail, in the hope of being able to detect some group of months which seemed to bear a peculiar relation to the rest, I met with a frequent recurrence of an exact inverse order between the warm months of the two decades; and often a direct ratio between the wet and dry.

During the first decade, the ratio between warm and cold, in the groups of January, February, March, April, August, September, October, and December, is invariably 6 to 4. It is one of greater inequality in the Junes and Novembers, being 8 to 2 in both cases; warm Mays are equal to the cold, but warm Julys preponderate in the proportion of 9 to 1.

In the second decade, the warm Novembers are to the cold the exact reverse of what they were in the first, being 2 to 8; and the ratios of Ja-

* I am indebted to Dr. Guy's Croonian Lectures for an insight into this method.

nuary, February, March, and April are also reversed, being 4 to 6, instead of 6 to 4.

When one decade is compared with the other, the last-named months are found to stand in exact inverse order, viz. 6 to 4 in the first, and 4 to 6 in the second.

The wet and dry groups seem, on the whole, to be more evenly balanced than the warm and cold; but the Novembers of the second decade are remarkable for dryness. The connexion between the predominant winds and the other states of weather has not as yet been traced systematically; but the diagram shows great excess of north-east wind in the spring of 1852, and a long continuance of cold weather setting in early in the following year. It is also evident that wind from south-east was more prevalent during the second than the first decade.

From the foregoing comparison of the different months, the group of Novembers seems to be the most exceptional; it may therefore be worth while to recapitulate the peculiarities that have been noticed.

1st. The ratio between the coefficients of this group in different decades is invariably one of considerable inequality.

2nd. Two cold Novembers only occur in the warm cycle, and only two warm ones in the cold cycle.

3rd. In the second decade the proportion of warm to cold Novembers is 8 to 2, and of dry and wet 2 to 8; but in the warm period warm and wet months were prettily evenly distributed.

4th. Novembers of comparatively low temperature, such for instance as those of 1851, 1853, 1854, 1855, 1856, 1860, 1861, and 1862, were in each year succeeding those enumerated, followed by Mays or Junes of a similar character. The following *résumé* shows the relations between the Novembers and the Junes.

Months.			
		Novembers.	Junes.
Guernsey.	{ 1st decade.	8 warm to 2 cold.	8 warm to 2 cold.
	{ 2nd decade.	8 cold to 2 warm.	7 cold to 3 warm.
Degrees.			
		Novembers.	Junes.
Guernsey.	{ 1st decade.	15°·7 plus to 4°·2 minus.	17°·5 plus to 3°·0 minus.
	{ 2nd decade.	14°·0 minus to 2°·8 plus.	18°·5 minus to 3°·1 plus.

These contrasts and analogies seem to justify the surmise that the atmospheric conditions of the former months may have exercised some influence upon those of the latter. Whether such be the case generally is not to be determined until a much longer series of results at Guernsey can be compared.

The peculiarities with respect to the Novembers may be purely accidental, or confined to the period under consideration; but that they are

not restricted to locality is proved by the Greenwich Tables, in which these groups stand out still more prominently (see Table VII.); the ratios between warm and cold being 9 to 1 in the first decade, and 1 to 9 in the second. It is difficult therefore to avoid the conclusion that, during the twenty years in question, the Novembers were exceptional months at both places; although at Guernsey they were more frequently followed by unfavourable Junes.

The Greenwich diagram (Diagram II. Archives), to which I must now briefly advert, does not exhibit so striking a contrast of light and shade as was observable at first sight in the other diagram. But on further examination it will be found that the warm months of the first decade correspond nearly in number with the cold months of the second, although not so exactly as at Guernsey.

	Months.		Degrees.	
Greenwich.	1st decade.	65 warm to 55 cold.	157°·5 plus	to 108°·5 minus.
	2nd decade.	62 cold to 58 warm.	148°·4 minus	to 116°·8 plus.

On comparing the above abstract with that in a previous page, it will be perceived that the disparity between the general results, from both places, is not very considerable; a similarity all the more remarkable, when we consider the great difference in position and latitude of the inland and the insular stations. See Diagram III.

It would be superfluous to enter into any further discussion of the various alternations which the coefficients are susceptible of, in a paper which is merely intended to direct attention to the accompanying diagrams and analytical tables. My motive for venturing to bring them under notice is a desire to place them in the hands of those better qualified than I am for conducting processes of induction; and as the modified plan I have adopted is based upon long recognized principles, which are applicable to the investigation of atmospheric phenomena in any locality, I trust that it may be deemed worthy of consideration.

IV. "Monthly Magnetic Determinations, from June to November 1866 inclusive, made at the Observatory at Coimbra," by Professor J. A. DE SOUZA, Director of the Observatory. Communicated (with a Note) by the President. Received May 8, 1867.

[NOTE.—These observations contain the record of the commencement of the absolute magnetic determinations at the Coimbra Observatory, with instruments procured by M. de Souza at Kew, and on the system of observation and reduction adopted at the Kew Observatory. The employment of the photographic continuously self-recording instruments at Coimbra has hitherto been delayed by the works required for the introduction of gas into the Observatory; but this has now been accomplished; and a letter, dated April 20, 1867, from the Director states that the photo-